REMARKS

Claims 1-23 are pending in the application. By this paper, claims 1, 5, 6 and 21 - 23 have been amended. No new matter is added by these amendments. The rewritten claims, marked up to show all the changes relative to the previous version of that claim, are attached hereto as an Annex following these remarks. Reconsideration and allowance of claims 1-23 in light of the amendments and arguments herein are respectfully requested.

New Matter Objection

The amendment filed July 8, 2002, stands objected to under 35 U.S.C. § 132. According to the office action, the amendment introduces new matter. Specifically, the office action asserts that the recitation in claims 21 and 22 of a "characteristic frequency response of the wheel" is not supported by the original disclosure. By this paper, claims 21 and 22 have been amended to instead recite a characteristic frequency response of the tire. This limitation is supported in the originally filed disclosure, for example, at page 2 lines 19-21 and in FIG. 3.

Accordingly, withdrawal of the objection under 35 U.S.C. § 132 is respectfully requested.

Allowable subject matter

The examiner has determined that claims 16-20 define allowable subject matter.

Claim rejection under 35 U.S.C. § 103

Claims 1-15, and 21-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fuller, et al., U.S. Patent number 6,292,095 B1 ("Fuller"). This rejection is respectfully traversed with respect to claims 13-15. Claims 1, 5, 6, 21 and 23 have been amended to distinguish the invention over Fuller.

The present invention defined by claims 1-23 relates to method and apparatus in a wireless remote tire pressure monitor system. Electromagnetic energy is used to wirelessly convey tire data from tire monitor transmitters at respective wheels of a vehicle and a radio receiver. Each tire has a characteristic frequency response. Because of the electromagnetic environment around the wheel, such as metallic strands within a runflat tire mounted on the

wheel, communication of the electromagnetic energy from transmitter to receiver will be distorted in accordance with the characteristic frequency response.

Claim 1 therefore recites tire monitors that are "configured to transmit tire data at a transmission frequency chosen in relation to the characteristic frequency response of the tire." Independent claims 5, 13, 16, 21 and 23 include similar limitations.

As noted at page 11, lines 27-31 of the present application, this design offers unique advantages over prior art systems. "By tuning the transmission frequency to the tire's frequency response, attenuation of the transmitted power of the radio signal is minimized, ensuring reliable reception of the tire data at the receiver. Further, a lower transmit power may be used in the transmitter, thus extending the battery life of the battery which powers the tire monitor."

Fuller discloses a tire monitor and system of the conventional type. A tire monitor is positioned inside a tire of a vehicle and measures tire characteristics such as pressure and temperature. A data transceiver transmits data about the tire characteristics to an external receiver. Fuller discloses two data transceiver embodiments, but using conventionally available radio devices. At column 6, lines 1-17, Fuller explains

> ...data transceiver 74, which may be a microstamp 20M remote intelligent communications unit model MSEML256X10SG manufactured by MICRON Technology, Inc., located in Boise, Id. Data transceiver 74 includes...transmission at a 2.44174 GHz center frequency. Reception employs a differential phase shift keyed modulated backscatter in the 2.400 to 2.4835 GHz band.... Alternatively and preferably, data transceiver 74 is a conventional 900 MHz data transceiver, such as ones employed in wireless telephones.....

Thus, Fuller fails to even recognize the problem solved by the present invention of claims 1-23, of selective attenuation of transmitted radio energy due to the characteristic frequency response of the tire. Moreover, Fuller fails to disclose or even suggest choosing or selecting or using a transmission frequency in relation to the characteristic frequency response of the tire.

The office action notes that allowed claims 16-20 recite specific steps of identifying or characterizing the frequency response of the tire, and then selecting a transmission frequency for the tire monitor using the frequency response of the tire. In contrast, according to the office action, the rejected claims recite a system lacking a means to positively determine the characteristic frequency response of a specific tire and then choosing the transmission frequency accordingly.

By this paper, claims 1, 5, 6, 21 and 23 have been amended to further distinguish the invention defined by these claims in the manner suggested by the office action. As amended,

claims 1, 6, 21 and 23 recite "a previously determined characteristic frequency response." Claims 5 and 22 recite a "previously identified passband" of the characteristic frequency response. Thus, as amended, these claims positively recite the concept of using a previously determined characteristic frequency response of the tire. As explained in the specification of the present application, the frequency response may be determined for an individual tire or for a model of tire, etc. Using this previously-determined characteristic frequency response, then the transmit frequency from the tire monitor can be chosen or configured for reduced attenuation of tire monitor transmissions. This enhances the reliability of communication of tire data in the system. These limitations of using a previously determined characteristic frequency response and a previously identified passband are nowhere shown, described or even suggested by Fuller or any of the prior art of record.

With respect to independent claim 13, this claim recites

> using the tire data to modulate a radio carrier signal, the radio carrier signal having a transmission frequency *chosen for reduced attenuation of the radio carrier signal by the tire. (emphasis added)*

This limitation is not disclosed in Fuller. As noted above, Fuller uses commercially available data transceiver transmitting at preset frequencies of about 2.4 GHz or 900 MHz. Fuller lacks any suggestion that these frequencies are chosen for any reason, much less being chose for reduced attenuation of the radio carrier signal, as required by claim 13. Since claim 13 recites limitations not shown in Fuller, claim 13 and its dependent claims 14 and 15 are allowable over this reference.

Accordingly, withdrawal of the rejections of claims 1-15 and 21-23 and allowance of these claims are respectfully requested.

With this response, the application is believed to be in condition for allowance. Should the examiner deem a telephone conference to be of assistance is advancing the application to allowance, the examiner is invited to call the undersigned attorney at the telephone number below.

Respectfully submitted,

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ANNEX

The amendments to the application, marked up to show the changes relative to the previous version, are shown below.

In the claims:

Claims 1, 5, 6, 21, 22 and 23 have been amended as shown below:

1. (Amended) A remote tire monitor system comprising:

a plurality of tire monitors associated with wheels of a vehicle, each wheel including a tire having a previously determined characteristic frequency response, each tire monitor including a transmitter configured to transmit tire data at a transmission frequency chosen in relation to the characteristic frequency response of the tire; and

a receiver configured to receive the tire data.

5. (Amended) A tire monitor mountable inside a tire, the tire monitor comprising:

a tire data sensor; and

a transmitter configured to transmit tire data at one or more transmission frequencies chosen to be within a previously identified passband of frequencies of the tire.

6. (Amended) The tire monitor of claim 5 wherein the tire has a previously determined characteristic frequency response including one or more identified attenuation bands and one or more identified passbands, the characteristic frequency response related to the structure of the tire, the transmission frequency chosen to be in the one or more identified passbands.

21. (Amended) A remote tire monitor system for a vehicle having a plurality of wheels, the remote tire monitor system comprising:

one or more tire monitors, each respective tire monitor being associated with a tire of a respective wheel of the vehicle, the [wheel] tire having a previously determined characteristic frequency response to electromagnetic energy imparted on the [wheel] tire, each respective tire monitor including

a respective tire data sensor, and

a respective radio transmitter coupled with the tire data sensor and configured to transmit electromagnetic energy to convey tire data, the respective radio transmitter transmitting the electromagnetic energy at one or more transmission frequencies chosen in relation to the characteristic frequency response of the [wheel] tire; and

a receiver configured to detect the transmitted electromagnetic energy.

22. (Amended) The remote tire monitor system of claim 21 wherein the respective radio transmitter transmits the electromagnetic energy at transmission frequencies chosen to be in a previously identified passband of the characteristic frequency response of the [wheel] tire.

23. (Amended) A tire monitor mountable inside a tire of a vehicle, the tire monitor comprising:

a tire data sensor to produce data indicative of a tire condition; and

a transmit circuit coupled with the tire data sensor to transmit tire data at one or more transmission frequencies chosen to be within a previously identified passband of frequencies of a previously determined characteristic frequency response to electromagnetic energy imparted on the tire.